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2.1: KNOCK-OUT OF MATRIX METALLOPROTEINASE-12 EXACERBATES COMPROMISED MECHANICAL HOMEOSTASIS IN ARTERIAL AGING

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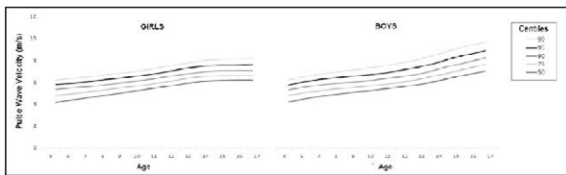
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brachial artery with a clinically validated automatic sphygmomanometer (OMRON 705IT) and an appropriately sized cuff. Gender-specific percentiles were used for the definition of the individual BP phenotype. Carotid-femoral PWV was measured to all participants at the third clinical evaluation, with the Complior SP device, complying with the methodological recommendations. All participants were evaluated by the same experienced clinician.

Results: Mean PWV was 6.20 ± 0.95 m/s and was higher in males compared with females (6.31 ± 0.97 m/s vs 6.02 ± 0.89 , respectively; $p < 0.0001$). Gender-specific percentile tables, accounting for age, were obtained from the normotensive participants ($n = 758$), as depicted in Figure 1. The determinants of PWV were assessed through linear regression. In a multivariable model, age, gender, blood pressure and family history of cardiovascular disease were significantly associated with PWV.

Conclusion: In children and adolescents, aortic PWV is strongly influenced by age, gender, BP and genetics, in line with the available evidences in adult populations. Further studies are needed towards a thorough understanding of the arterial dynamics at these ages.



Oral Session II – Young Investigator Award

2.1 KNOCK-OUT OF MATRIX METALLOPROTEINASE-12 EXACERBATES COMPROMISED MECHANICAL HOMEOSTASIS IN ARTERIAL AGING

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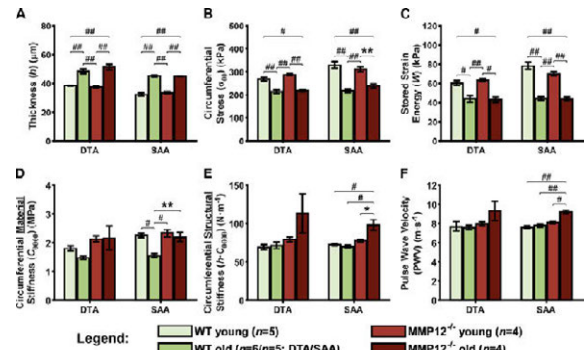
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Background: Matrix metalloproteinase-12 (MMP12) may modulate arterial stiffening with age [1]. We aimed to study the effect of aging on biaxial arterial stiffness in wild-type (WT) and MMP12 knock-out (MMP12^{-/-}) mice.

Methods and Results: After euthanasia, descending thoracic (DTA) and suprarenal abdominal (SAA) aortas of young and old, WT (ages 21 ± 0 and 103 ± 1 weeks; mean \pm SE) and MMP12^{-/-} (13 ± 0 and 52 ± 0 weeks) male mice were dissected and cannulated on glass pipettes in a computer-controlled biaxial testing device. Pressure-diameter tests were performed at 95%/100%/105% of estimated in vivo stretch; axial force-length tests at pressures of 10/60/100/140 mmHg. Data were fitted using a four-fiber constitutive model [2]. WT and MMP12^{-/-} blood pressures were comparable ($133/88$ vs. $126/93$ mmHg; SBP/DBP; telemetry); WT aging did not influence blood pressure [3]. All metrics are therefore presented at a common pressure (figure). At first sight, MMP12^{-/-} aging resembles WT aging: increased wall thickness (figure, panel A) leading to decreased circumferential stress (B) and decreased stored strain energy (C) [3-5]. However, in WT aging, circumferential material stiffness decreased, which did not occur in MMP12^{-/-} (D). Structural stiffness and pulse wave velocity remained constant in WT mice but increased in MMP12^{-/-} (E-F).

Discussion: Our findings suggest that in both WT and MMP12^{-/-}, mechanical homeostasis with aging was compromised, a finding that was exacerbated with MMP12^{-/-}. MMP12^{-/-} was previously reported to reduce age-associated stiffening [1]. This contradictory finding may be explained by the use of atomic force microscopy in [1] (measuring compressive stiffness) versus our use of tensile biaxial testing.



h, σ_c , U, C_c , and hC_c calculated for SBP=120 mmHg. PWV calculated using Bramwell-Hill equation for SBP/DBP=120/80 mmHg. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. ANOVA followed by Tukey's test.

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2.2 GREATER BLOOD PRESSURE VARIABILITY IS ASSOCIATED WITH LOWER COGNITIVE PERFORMANCE – THE MAASTRICHT STUDY

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An increasing number of individuals will face age-related cognitive difficulties, as life expectancy has increased globally. It is therefore important to identify modifiable risk factors for cognitive impairment. Very short- to mid-term blood pressure variability (BPV) may be such factor, as it may cause cerebral ischemia via various mechanisms. To this end, we investigated whether greater diastolic (dBPV) and systolic BPV (sBPV) are cross-sectionally associated with memory function (MF; $n = 1804$), information processing speed (IPS; $n = 1793$), and executive function (EF; $n = 1780$), in 40- to 75-year-old individuals from The Maastricht Study. A composite BPV-index was derived by standardizing and averaging within-visit, 24-hour and 7-day BPV. We performed linear regression with adjustments for age, sex, educational level, 24-hour DBP or SBP, and cardiovascular risk factors. We found that a 1-